HOMEWORK 10 **NAME:** ______________________________
ELEMENTARY STATISTICS & INFERENCE
STAT:1020; BOGNAR

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1. The gain of a certain type of JFET transistor follows a normal distribution with mean μ and standard deviation σ. An electrical engineer randomly selected 7 transistors, and computed $\bar{x} = 116.2$ and $s = 7.8$.

   (a) Find a 95% confidence interval for μ.

   (b) Interpret the CI in (1a).

   (c) Based upon your answer in (1a), does μ significantly differ from 120? Why?

   (d) Could we find the CI in (1a) if the gains did not follow a normal distribution? Why?

2. The amount of time per day (in hours) office workers spend working on a computer can be modeled by a normal distribution with mean μ and standard deviation σ. A manager wants to infer about the population mean μ, so he randomly selects 5 employees and observes their work habits. The raw data is:

   $$6.5,\ 7.1,\ 5.9,\ 6.2,\ 6.3$$

   (a) Compute the sample mean $\bar{x}$ and the sample standard deviation s.

   (b) Find a 99% confidence interval for μ.

(c) Interpret the CI in (2b).

(d) Based upon your answer in (2b), does μ significantly differ from 8 hours? Why?

3. The longevity of truck tires (in months) has a normal distribution with mean μ months and standard deviation $\sigma = 8.0$ months. Suppose $n = 16$ tires are randomly selected and the sample mean longevity $\bar{x} = 42.5$ months.

   (a) Test $H_0 : \mu = 40$ versus $H_a : \mu \neq 40$ at the $\alpha = 0.05$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (b) Based upon your answer in 3a, does the mean longevity μ significantly differ from 40? Why?

   (c) Find a 95% CI for the mean longevity μ.

   (d) Based upon your answer in 3c, does the population mean longevity μ significantly differ from 40? Why?

   (e) Based upon your answer in 3c, will the $p-$value for the test in 3a be less than α or greater than α? Why?

   (f) Find the $p-$value for the test in 3a.

   (g) Based on your answer in (3f), does the population mean longevity μ significantly differ from 40? Why?

4. The diastolic blood pressure, X, of smokers follows a normal distribution with mean μ and standard deviation $\sigma = 15$, i.e. $X \sim N(\mu, \sigma = 15)$. The diastolic blood pressure of 3 randomly selected smokers was:

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125 140 125
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(a) Find a 90% CI for the population mean diastolic blood pressure μ.

(b) Test $H_0 : \mu = 140$ vs. $H_a : \mu \neq 140$ at the $\alpha = 0.10$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

(c) Find the $p-$value for the test in 4b.

(d) Based upon your answer in 4c, does the population mean diastolic blood pressure μ significantly differ from 140? Why?

(e) Based upon your answer in 4a, does the population mean diastolic blood pressure μ significantly differ from 140? Why?

5. In the Iowa Driving Simulator, the number of times the center line is crossed by individuals that are under the influence of alcohol has a distribution that is skewed to the right with mean μ and standard deviation $\sigma = 7$. For the 49 participants that drove after drinking alcohol, the mean number of times the center line was crossed was $\bar{x} = 10$.

   (a) Test $H_0 : \mu = 12$ versus $H_a : \mu \neq 12$ at the $\alpha = 0.05$ significance level. *Find the test statistic and critical value, plot the rejection region, and state your decision and final conclusion.*

   (b) Based upon your answer in 5a, will the $p-$value for the test be less than α or greater than α? Why?

   (c) Find the $p-$value for the test in 5a.

   (d) Based upon your answer in 5c, does the mean number of crossings μ significantly differ from 12? Why?

   (e) Could we perform the above analysis if the sample size $n < 30$? Explain.